PREFINAL REPORT

for the

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP), EUROPE

at the

PIRMASENS MILITARY COMMUNITY

VOLUME I: EXECUTIVE SUMMARY

Prepared for:

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Harvey E. Edwards, P.E.
Senior Project Engineer

B.N. Gidwani, P.E.
Project Manager

Prepared by

GILSTON INTERNATIONAL, INC.
Designers - Consultants
West Chester, Pennsylvania 19380

W.O. No. 0335-61-01

DEPARTMENT OF THE ARMY

CONSTRUCTION ENGINEERING RESEARCH LABORATORIES

P.O. Box 4005

CHAMPAIGN, ILLINOIS 61820-8305

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PROJECT PARTICIPANTS

The following members of the Staff of Weston International, Inc. have participated in the planning and execution of this project, and in the preparation of this report.

A. W. Hogeland, P.E. Vice President Energy Department	Design and Management Management Division
B. N. Gidwani, P.E. Project Manager Energy Department	Design and Construction Management Division
Harvey C. Bounds, P.E. Senior Project Engineer Energy Department	Design and Construction Management Division
Paul Hurst Senior Project Engineer Design Department	Design and Construction Management Division
L. O. Pietila, P.E. Senior Project Engineer Energy Department	Design and Construction Management Division
Dennis C. Flynn, P.E. Project Engineer Energy Department	Design and Construction Management Division
Gerald Miklosh, P.E. Project Engineer Energy Department	Design and Construction Management Division
David I. Rowland Assistant Project Engineer Energy Department	Design and Construction Management Division
Mukesh G. Mirchandani Assistant Project Engineer Energy Department	Design and Construction Management Division
Annette Bianchi Engineering Technician Energy Department	Design and Construction Management Division
Kenneth W. Remondo Assistant Electrical Engineer Design Department	Design and Construction Management Division
Andrew J. Semeister Senior Analyst Systems Engineering	Systems and Policy Division
G. Stanley Wright, Jr. Senior Programmer Systems Engineering	Systems and Policy Division
Gaby P. Koshy Programmer Systems Engineering	Systems and Policy Division

In addition to the WESTON staff, the following members of the ECOSYSTEM Group were integrally involved in this project:

Dr. Egon Keller President	ECOSYSTEM
Guenter Oellig Machinenbau Techniker	GVT
Karlheinz Muller Ober-Ing. (Grad.)	GVT
Trudy Drosscher Project Manager	ITK

SECTION I

EXECUTIVE SUMMARY

1.1 INTRODUCTION

Contract No. DACA 90-81-C-0072 directs that a basewide energy study be accomplished for the Mannheim and Pirmasens Military Communities, Federal Republic of Germany. The project is identified as Energy Engineering Analysis Program (EEAP) Package No. 5.

The overall objective of the study is to produce a systematic plan of improvement projects that will reduce by 1985 the energy consumption in compliance with the Army Facilities Energy Plan without decreasing the readiness posture of the Army.

The following installations within the Pirmasens Community were included in this study:

Installation No.	Designation
GY-340	Muenchweiler Hospital
GY-450	Fishbach Ord Depot
GY-472	Hasswelier UG Storage
GY-533	Hochmuehlbach Railhead

The study is conducted in three phases, namely:

- Phase I - The gathering of data and inspection of the facilities in the field. This phase included visits to the 4 different installations during which 68 of approximately 83 facilities were examined. The gathering of data involved the taking of notes and making tape recordings of findings, photographing of facilities (where permitted), the collection of available plans and records, and conferences with EUD and Community facility engineering personnel.

  The survey revealed that some of the selected buildings had little or no energy use, or were not representative of the facilities in the installation. As a result, certain buildings were deleted. Others were added which were deemed necessary for an accurate energy consumption of each installation to be developed. A final figure of 63 buildings resulted from this process.

  The information gathered during the survey has been consolidated and included in the Preliminary Submittal made at the completion of this phase. Included in the report are listings of potential energy conservation measures which were developed as a result of the field survey.

- Phase II - The analysis of the collected data permitted the calculation of the existing energy consumption of the selected facilities within each installation; and the calculation of the energy savings due to the implementation of proposed Energy Conservation Measures (ECMs). These values are extrapolated to the remainder of the facilities to develop installation-wide and Community-wide energy consumptions, energy savings, and proposed FYBS energy use.

  Each Energy Conservation Measure (ECM) was evaluated in accordance with Energy Conservation Improvements Program (ECIP) criteria to determine its economic feasibility. ECM Projects from Increments A and B are divided into ECIP Projects, Increment G Projects, and Increment F Projects. This Report includes the ECIP Projects, and Increment G Projects. The Increment F Projects are included in a separate report.

  The ECIP Projects are ranked according to SIR (Savings Investment Ratio) value.

- Phase III - The Prefinal and Final submissions of this report covers the work of this phase.

  The Prefinal submission consists of an addendum to the Interim submittal, a revised Executive Summary, and complete 1391's for the five ECIP projects developed for the Pirmasens Community. Following the receipt of comments on the Prefinal submission, a complete Final Report will be submitted.

SECTION 2

EXISTING ENERGY CONSUMPTION

2.1 FY75 BASELINE ENERGY CONSUMPTION

The energy consumption for FY75 for those installations of the Pirmasens Military Community covered by this study was:

Electricity	5,730,700 kWh
No. 2 Fuel Oil	400,000 Gal.
Bituminous Coal	5,525 Metric Tons

These values were provided by the Pirmasens Community. Figures 2.1 and 2.2 present energy consumption for No. 2 Fuel Oil and Bituminous Coal's for the entire Pirmasens Community.

2.2 SOURCE ENERGY CONSUMPTION

Table 2.1 presents the source energy consumption by fuel type for FY79, FY80, and FY81 for only the installations included in this study. The values in Btu were developed using the following energy conversion factors.

Electricity	11,600 Btu/kWh
Distillate Fuel Oil (No. 2)	138,700 Btu/Gal.
Bituminous Coal	27,094,000 Btu/Metric Ton

The conversion factors for electricity and No. 2 Fuel Oil were taken directly from the energy conversion factors in the ECIP Guidance. The Bituminous Coal values were obtained by converting the figures in the ECIP Guidance to metric tons. Energy costs were developed using the conversion factor of 2.26 D Mark/$ as directed by EUD.

ELECTRICAL ENERGY COST

Throughout the report, 11,600 Btu/kWh has been used as the conversion factor from kilowatt hours to Btu. As a result, energy savings (MBtu) are in terms of "source" energy. Unit energy costs ($/MBtu) also are in terms of source energy.

If "load" energy is used as a basis for energy savings - then 3,414 Btu/kWh is the conversion factor. When load energy is considered, the magnitude of energy savings is decreased, but the unit cost ($/MBtu) is increased proportionally. The result is that the energy cost savings using "source" or "load" energy is the same for both methods. The following example illustrates this point:

Electricity Savings = 5,000 kWh

- Source Energy Method:

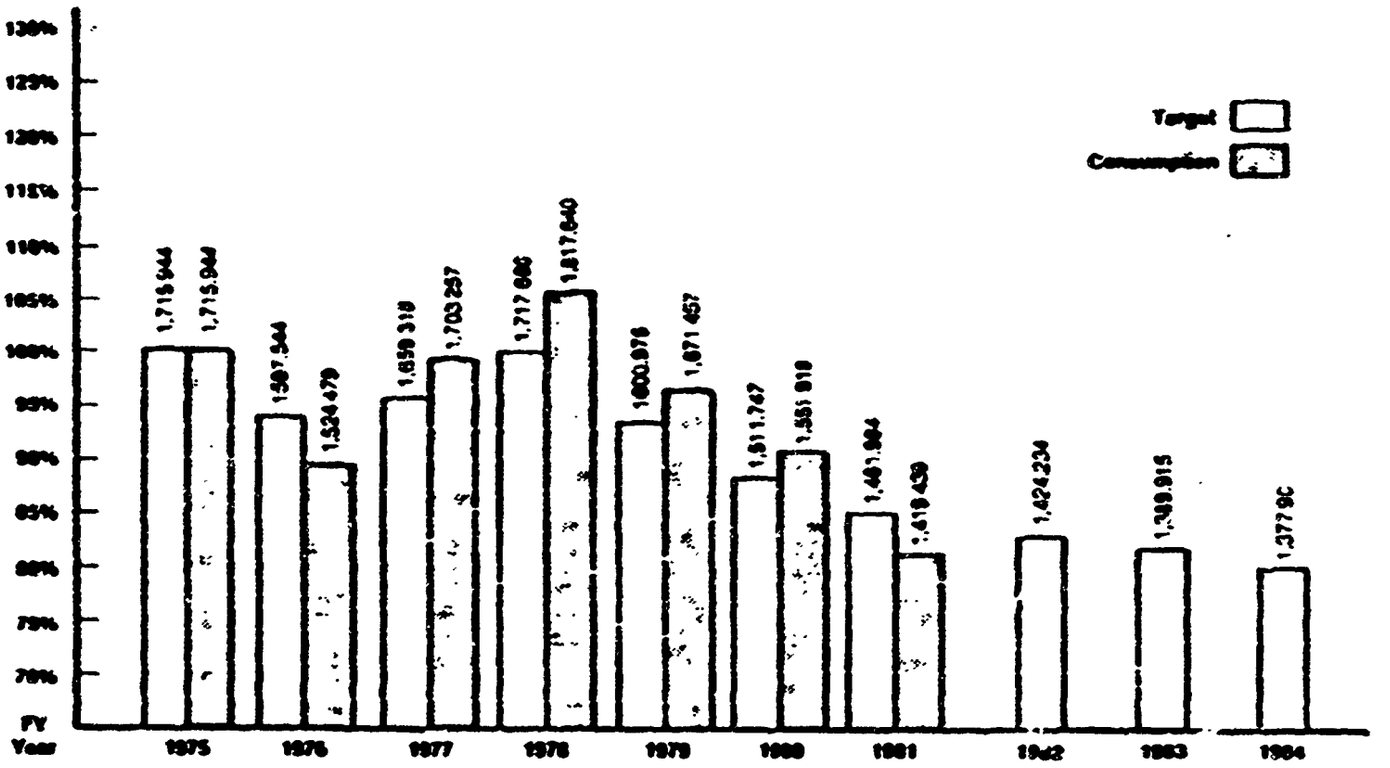
  $$\text{Energy Savings} = 5{,}000 \text{ kWh} \times 11{,}600 \frac{\text{Btu}}{\text{kWh}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = 58 \text{ MBtu}$$

  Energy Cost Savings = 58 MBtu x $4.15 /source MBtu = $241

- Load Energy Method:

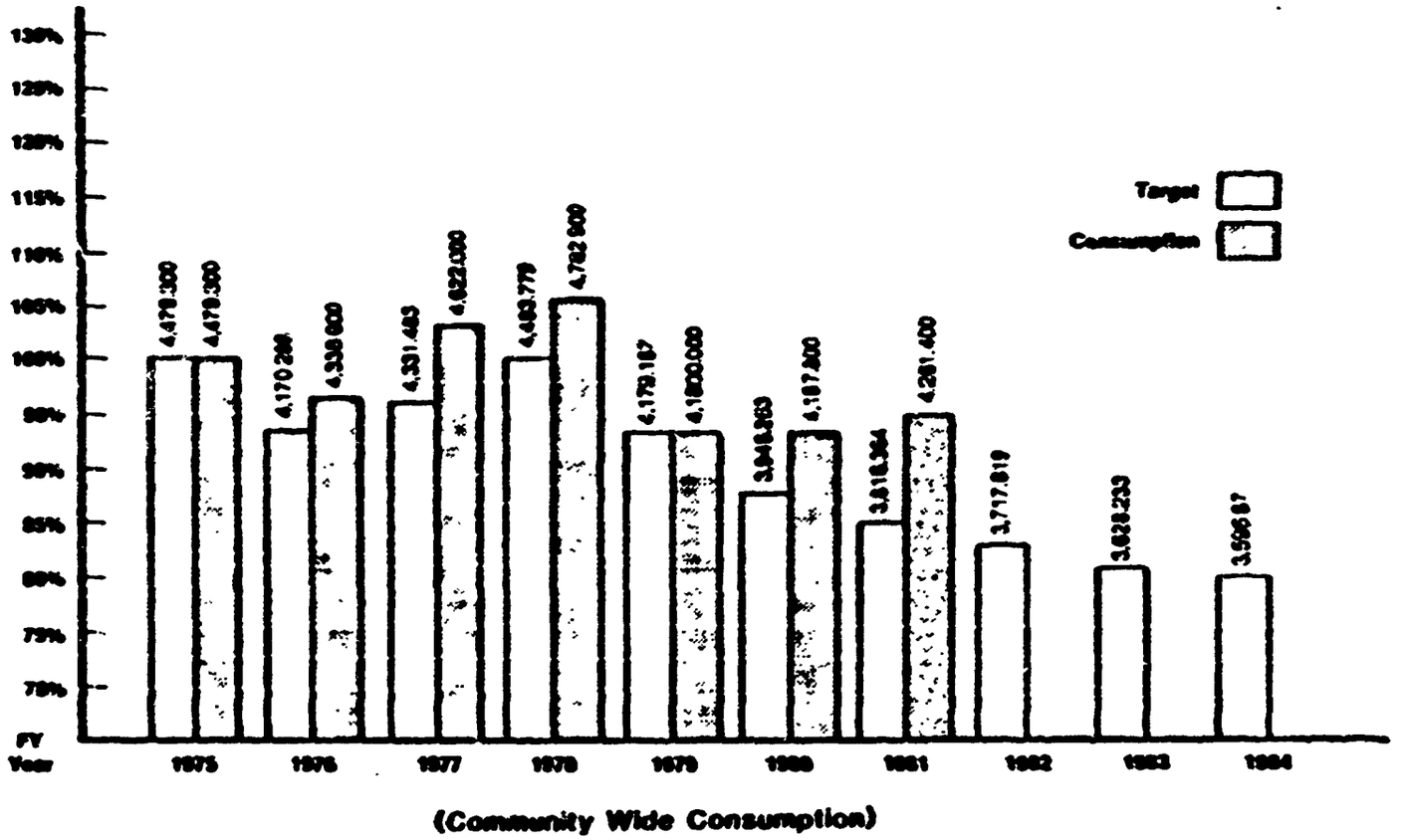
  $$\text{Energy Savings} = 5{,}000 \text{ kWh} \times 3{,}413 \frac{\text{Btu}}{\text{kWh}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = 17.1 \text{ MBtu}$$

  Energy Cost Savings = 17.1 MBtu x $14.09/load MBtu = $241



(Community Wide Consumption)

FIGURE 2.1 TARGET AND CONSUMPTION #2 FUEL OIL IN GAL



(Community Wide Consumption)

FIGURE 2.2 TARGET AND CONSUMPTION BITUMINOUS COAL IN M/Te.

TABLE 2.1

SOURCE ENERGY CONSUMPTION FY79, FY80, FY81

(For the Four Installations Included in this Study)

Fuel Type	FY79 Quantity	FY79 Cost ($)	FY79 Btu x 10^9	FY80 Quantity	FY80 Cost ($)	FY80 Btu x 10^9	FY81 Quantity	FY81 Cost ($)	FY81 Btu x 10^9
Electricity (KWH)	3,156,686	331,577	82.95	7,935,024	363,370	84.90	7,640,540	307,337	86.09
Fuel Oil No. 2 (Gal.)	[illegible]	468,015	62.63	379,521	305,073	52.64	335,[illegible]	327,460	46.47
Bituminous Coal (ST tons)	4,488	[illegible]	113.25	4,192.8	405,337	113.46	4,287.0	415,006	106.97
TOTALS		1,156,576	256.83		1,073,780	252.00		1,084,650	239.53

2.3 TOTAL ANNUAL ENERGY CONSUMPTION

The annual source energy consumption for the 4 installations in this study as shown on Table 2.1 is:

$$FY79 - 256.83 \times 10^9 \text{ Btu}$$
$$FY80 - 252.01 \times 10^9 \text{ Btu}$$
$$FY81 - 249.53 \times 10^9 \text{ Btu}$$

If these figures are related to the FY75 baseline energy consumption of 277.16×10^9 Btu, it is noted that the FY79 consumption is 92.7% of FY75, FY80 consumption is 90.9% of FY75; and FY81 consumption is 90.0% of FY75.

It should also be noted that FY80 energy consumption was 1.8% less than FY79; and FY81 was 2.8% less than FY79.

2.4 BUILDING GROUP SOURCE ENERGY CONSUMPTION

Table 2.2 presents the energy consumption by building group type for each installation in this study. These summaries were extracted from the computer printouts contained in Volume 4, Section 4 of this report.

2.5 TYPICAL BUILDING ENERGY CONSUMPTION

Table 2.3 presents values for typical building energy consumption for each of the 13 building group types shown in Table 2.2. Values are given in units of MBtu/yr per square foot (ft^2) of floor area. Values for MBtu/yr were obtained from the Totals column of Table 2.2 The individual buildings included in each building group are listed in the Volume 4 computer printouts, and floor areas are from the building list contained in Section 9 of the main report, Volume II.

TABLE 2-2

BUILDING GROUP SOURCE ENERGY CONSUMPTION
AS PREDICTED BY COMPUTER [illegible] MODEL
(Energy Consumption in MBtu/yr)

Type No.	Building Type	[illegible] (Hospital)	[illegible] Bed. Depot	[illegible] US Storage Area	[illegible] Railhead	Total MBtu/yr
10	Barracks	30,851.47	11,411.36	7,997.36		51,260.04
20	Chapels	347.17	611.94			959.08
30	Exchanges		8,291.61			8,291.61
40	Family Housing	19,283.80				19,284.00
50	Gymnasium		1,819.50			1,819.50
60	High Bay Shop	464.03				464.03
70	Hospital	7,440.95				7,440.95
80	Messhall	3,529.80	560.95			4,090.75
90	Office		4,212.00			4,212.00
100	School	345.50	1,169.96			1,535.46
110	Shop	1,369.96	19,236.22	1,486.50		22,092.36
120	Warehouse	1,750.23	3,062.44		3,112.07	7,472.73
130	Others	2,687.11	1,981.94	533.95		5,202.57
	TOTAL	68,946.06	52,893.77	10,017.42	3,112.07	124,573.32

TABLE 2-3

TYPICAL BUILDING ENERGY CONSUMPTION

Building Group Type

Type No.	Description	Total Annual Energy Consumption (From Table 2.3) (MBtu/yr)	Total No. of Bldgs.	Total Bldg. Floor Area (ft^2)	Typical Energy Consumption (Btu/yr per ft^2)
10	Barrack	51,260	16	333,743	153,591
20	Chapel	979	2	8,679	107,040
30	Exchange	1,292	1	7,726	167,227
40	Family Housing	19,282	4	78,438	245,825
50	Gymnasium	1,820	1	13,230	137,528
60	High Bay Shop	464	1	4,799	96,687
70	Hospital	7,441	4	68,756	108,223
80	Mess Hall	4,491	2	38,681	116,104
90	Office	1,212	3	7,958	152,300
100	School	1,535	2	16,738	91,707
110	Shop	4,800[1]	9	30,434[1]	157,718[1]
120	Warehouse	7,473	4	69,703	105,546
130	Others	5,283	7	39,862	132,532
	TOTALS:	107,282	56	718,747	149,263

NOTE[1]: Total does not include building 7154 which has a lot of equipment, and is not typical of the other shops.

SECTION 3

ENERGY CONSERVATION MEASURES DEVELOPED

3.1 ENERGY CONSERVATION MEASURES INVESTIGATED

A list of Energy Conservation Measures (ECM's) to be investigated is contained in ANNEX A of the EEAP Scope of Work. This list, along with previous energy conservation retrofit experience, and the observations and data obtained from two site visits, provided a basis for a list of ECM's to be quantitatively analyzed.

For Increments A, B, C the ECM's involved are:

Building Shell:

- Wall insulation
- Roof & attic insulation
- Storm windows
- Energy efficient windows
- Weatherstrip windows
- Weatherstrip personnel doors
- Weatherstrip vehicular doors
- Reduce window area
- Translucent insulating panels
- Entrance vestibules
- Replace vehicular door with wall
- Caulking

Heating and Ventilating:

- Destratification
- Ventilating type hoods
- Radiator thermostatic control valves
- Heat Recovery
- Pipe insulation

Domestic Hot Water:

- Flow restrictors

Electrical:

- Interior lighting conversions
- Exterior lighting conversions
- Delamping
- Photocell switches

Central Plant & Distribution Systems (Increment B)

- Hot water vs. steam boilers
- Boiler trim controls
- Heat Recovery from boiler blowdown
- EMCS
- Boiler economizers

In Chapter 10 of the Main Report (Volume II) a dot matrix is included showing the buildings at each installation for which the ECM was applicable and was analyzed. The matrix also includes whether the ECM was economically feasible (SIR> 1) and was developed into an ECIP Project or was not (SIR$\leq$1), or was developed into an Increment G project (none were).

Other ECM's analyzed are included under Increment F. Refer to that separate volume. Most of those are analyzed on a unit basis for use by Facilities Engineer (FE) personnel to develop projects. Refer to Tables G-1 and G-2 in Section G for a summary of these projects. ECM's listed in Annex A which were not analyzed, were either not applicable, already implemented, or are scheduled to be implemented. The status of each Annex A ECM is discussed in Section 10 of the Main Report (Vol. II)

The results of the analysis of each ECM are presented in Table 3.1 (2 pages). Results for individual buildings are included with the ECM section in Appendix Volume III B.

3.2 ECIP PROJECTS DEVELOPED

Table 3.2 presents a summary of all the ECIP Projects. These 5 projects are comprised of discrete ECM's all of which have SIR > 1. The grouping of ECM's to produce ECIP Projects as shown is tentative, and is presented for review and modification as desired by the Facilities Engineer.

3.3 OTHER ENERGY CONSERVATION PROJECTS

Increment G Projects are formed from ECM's which do not meet ECIP criteria, namely, ESIR value less than 1 and are above the FE funding limits of $500,000 for new and alteration type work, and $200,000 for O & M type work. None of the projects investigated fell into this category i.e., there are no increment G Projects. Refer to Section 10 of Part B of the Main Report (Volume II) for a complete discussion of the differences between increments A, B, G, F, and ECIP Projects.

Increment F Projects (refer to Section 6) were analyzed mostly on a unit basis, for development into desired projects by the Facilities Engineer.

3.4 POLICY CHANGES/RECOMMENDATIONS

During the site visits, the Facility Engineering personnel for the Community and the Installation Coordinators at the various installations were interviewed to develop an overview of the energy conservation policies in effect and their effectiveness in reducing energy consumption.

TABLE 3.1 (p. 1 of 2)

PIRMASENS MILITARY COMMUNITY
ECO ANALYSIS SUMMARY

ECO Project Name	Annual Energy Savings (MBTU): Electricity	Annual Energy Savings (MBTU): #2 Fuel Oil	Annual Energy Savings (MBTU): Bitum. Coal	Annual Energy Savings (MBTU): Total	Annual Energy Cost Savings ($)	Total Life Cycle Cost Discounted Savings ($)	Total Project Cost ($)	Simple Payback (Yrs.)	SIR
Building Envelope									
Wall Insulation		590.1		590.1	4,170	47,350	3,200	0.8	14.8
Roof & Attic Insulation		8315.9	9094.5	17410.4	96,000	1,240,500	234,840	2.4	5.3
Storm Windows		1413.8	11303.8	12717.6	56,230	825,000	325,740	5.8	2.5
Energy Efficient Windows				8787.0	27,800	407,080	814,270	29.3	0.5
Weatherstrip Windows		292.8	5493.4	5786.2	34,310	211,940	31,840	2.2	6.7
Weatherstrip Personnel Doors		15.7	39.6	55.3	260	3,740	610	2.3	6.2
Weatherstrip Vehicular Doors		153.6	38.8	192.4	1,250	14,800	4,950	4.0	3.0
Reduce Window Area		374.0	129.8	503.8	3,176	38,210	16,230	5.7	2.1
Translucent Insulating Panels		19.2		19.2	136	1,545	1,655	12.2	0.9
Entrance Vestibule		6.4		6.4	45	511	2,060	64.0	0.2
Replace Vehicular Door w/Wall		248.0		248.0	1,753	19,920	10,960	6.3	1.8
Caulking			801.8	801.8	3,279	50,460	3,507	1.1	14.4
Heating and Ventilating									
Destratification	(-270.6)	1564.6	363.0	1727.0	11,700	140,140	21,690	1.9	6.5
Ventilation Fuel Rooms	(-246.2)	1138.7		892.5	7,850	80,200	24,570	3.5	3.3
Radiator Therm. Control Valves		10888.0		10888.0	76,575	876,500	161,750	2.1	5.4
Heat Recovery		2310.0	6065.0	8375.0	41,140	567,500	68,900	1.7	8.2
Pipe Insulation			4920.0	4920.0	20,100	309,300	286,100	14.2	1.1
Domestic Hot Water									
Flow Restrictions		854.0	2369.9	3223.9	15,730	237,600	23,210	1.5	9.4
Electrical									
Interior Lighting Conversion	4771.8			4771.8	19,800	218,050	89,890	4.5	2.4
Exterior Lighting Conversion	92.7			92.7	350	4,250	2,550	7.6	1.4
Delamping	451			451	1,875	20,600	245	0.5	84.1
Photocell Switches	52.1			52.1	216	2,380	3,250	15.0	0.7

TABLE 3.1 (p. 2 of 2)

ECM ANALYSIS SUMMARY

PROGRAMS PRELIMINARY [illegible]

ECM Project Name	Electricity	#2 Fuel Oil	Bitum. Coal	Total	Annual Energy Cost Savings ($)	Total Life Cycle Cost Discounted Savings ($)	Total Project Cost ($)	Simple Payback (Yrs.)	SIR
Central Plant Modifications									
Hot Water vs. Steam Boilers		162.0	486.0	648.0	3,133	43,560	378,400	121.0	0.1
Energy Conservation Controls		375.0	9182.0	9557.0	19,760	293,400	72,500	3.7	*4.1
Condensate Heat Recovery			1357.0	1357.0	5,486	84,450	11,710	2.1	*7.2
EMCS			1745.0	1745.0	7,159	109,750	295,700	41.2	0.4
Boiler Economizer		1611.0		1611.0	11,950	179,300	750,000	69.4	*0.2

NOTE: ECM's for which some of the buildings analyzed were economically feasible (SIR > 1) are indicated by "*". For these ECM's the values reported include only the buildings with SIR > 1.

TABLE 3.2

ECIP PROJECT SUMMARY
PIRMASENS MILITARY COMMUNITY

IP Project Number	ECIP Project Name	ANNUAL ENERGY SAVINGS (MBTU/YR): Electricity	#2 Fuel Oil	Bituminous Coal	Total	Annual Energy Cost Savings ($)	Life Cycle Cost PW Discounted Savings ($)	Investment Cost ($)	SIR
#1	Roof Insulation		8315.9	9094.5	17410.4	96,000	1,240,500	651,270	1.9
#2	Misc. Projects I	6397.7	4629.5	5804.7	16831.9	74,720	938,360	213,860	4.4
	• Interior Lighting	(4771.8)			(4771.8)	(19,800)	(218,850)	(96,720)	(2.3)
	• Ventilation Hoods	(246.2)	(1158.7)		(897.5)	(7,090)	(80,200)	(26,700)	(5.5)
	• Flow Restrictors		(854.0)	(2369.9)	(3223.9)	(15,730)	(217,660)	(23,210)	(9.4)
	• Destratification	(-220.6)	(1584.6)	(363.0)	(1727.0)	(11,790)	(140,140)	(21,690)	(6.5)
	• Exterior Lighting	(92.7)			(92.7)	(930)	(4,290)	(2,140)	(2.0)
	• W-Strip Windows		(792.8)	(2995.4)	(5786.2)	(14,310)	(211,900)	(31,040)	(6.7)
	• W Strip Pers Doors		(15.7)	(39.6)	(55.5)	(260)	(3,740)	(610)	(6.2)
	• W Strip [illegible] Doors		(155.6)	(38.8)	(192.4)	(1,250)	(14,800)	(4,950)	(3.0)
	• Wall Insulation		(590.1)		(590.1)	(4,170)	(47,930)	(10,130)	(4.7)
#3	[illegible]		1415.9	11303.9	12717.6	56,790	825,000	325,740	2.5
#4	Misc. Projects II		10195.6	12538.0	26710.0	151,570	1,928,270	347,560	5.6
	• Reduce Window Area		(374.0)	(129.8)	(503.8)	(3,176)	(58,210)	(18,250)	(2.1)
	• Replace Win Blk Walls		(248.0)		(248.0)	(1,755)	(19,920)	(10,960)	(1.8)
	• Caulking			(881.8)	(881.8)	(3,279)	(50,466)	(3,507)	(14.4)
	• Rep. Steam Control Valves		(10888.0)		(10888.0)	(76,975)	(874,500)	(161,750)	(5.4)
	• Heat Recovery		(2710.0)	(6065.0)	(8375.0)	(41,340)	(567,900)	(68,980)	(8.2)
	• [illegible] Combustion		(375.0)	(4182.0)	(4557.0)	(19,760)	(295,400)	(72,500)	(4.1)
	• [illegible] Heat Recovery			(337.0)	(1557.0)	(5,086)	(84,430)	(11,710)	(7.2)
#5	Pipe Insulation			4920.0	4920.0	20,100	309,300	286,100	1.1
TOTALS FOR ALL ECIP PROJECTS		6397.7	78550.6	45618.0	76590.8	398,620	5,241,460	1,827,550	2.9

NOTE.

VALUES IN PARENTHESES ARE FOR INDIVIDUAL ECO'S WITHIN ECIP PROJECT.

SECTION 4

ENERGY AND COST SAVINGS

4.1 BASE-WIDE CONSUMPTION AFTER ENERGY CONSERVATION PROJECTS

As presented in Table 4.1, the FY81 source energy consumption for the four installations of the Pirmasens Community in this study was 249,550 MBtu. The implementation of the proposed five ECIP Projects will result in an annual energy savings of 76,590 MBtu/year. Energy consumption would be 172,960 MBtu/yr. This represents a 30.7% reduction in energy use.

As also presented in Table 4.1, the annual energy cost for the four installations in this study at Pirmasens in FY81 was $1,164,400. The energy cost savings resulting from the ECIP Projects is $398,610. The energy cost after implementing the ECIP Projects will be $765,780. This represents an energy cost reduction of 34.2%.

4.2 ALLOCATION OF ENERGY CONSERVATION PROJECT SAVINGS

Table 3.2 presented a breakdown of the energy savings by ECIP Project. A more detailed breakdown of savings by ECM and building is contained in Volume IV (Bundles).

4.3 PROJECTED ENERGY CONSUMPTION

As stated above, annual energy consumption for these four installations will decrease by an estimated 76,590 MBtu/yr from 249,550 MBtu/yr to 172,960 MBtu/yr following the implementation of the proposed ECIP projects.

4.4 PROJECTED ENERGY COSTS

Annual energy costs for these four installations will decrease by $398,610/year from $1,164,400 per year to $765,780 per year after the implementation of these proposed ECIP projects. These predicted costs are in terms of FY81 dollars as required by the SIR analysis and does not include the general rate of inflation, or inflation of fuel costs.

TABLE 4.1

ENERGY USE AND SAVINGS SUMMARY FOR
THE 4 INSTALLATIONS INCLUDED IN THIS STUDY

PIRMASENS MILITARY COMMUNITY

Fuel	EXISTING FY 81		ECIP PROJECT SAVINGS		PROJECTED AFTER ECIP	
	Energy Use (MBtu/yr)	Energy Cost ($/yr)	Annual Energy Use (MBtu/yr)	Annual Energy Cost ($/yr)	Annual Energy Use (MBtu/yr)	Annual Energy Cost ($/yr)
Electricity	86,889.4	$360,590	4,397.7	$ 18,250	82,491.7	342,340
#2 Fuel Oil	46,487.1	328,660	28,554.4	201,880	17,932.5	126,780
Bituminous Coal	116,173.6	475,150	43,638.0	178,480	72,535.6	296,670
TOTAL	249,550.1	$1,164,400	76,590.3	$398,610	172,959.8	$765,790

SECTION 5

CENTRAL BOILER PLANTS

5.1 Background

This contract does not include increment E. However, during the meeting at EUD on 24 March 1982, Mr. Gunzel of EUD requested the study should include a brief feasibility summary of the opportunity for centralization at the communities studied.

5.2 Results and Recommendations

Contrary to the overall conclusion drawn in the Mannheim study that centralizations and upgrading be directed toward eventual tie-ins to the Municipal District hot water heating system, the Pirmasens Area facilities at Muenchweiler, Masweiler, Hoehmuehlbach, and Fischbach are too isolated to utilize district heating effectively.

Thus, with the possible exception of Muenchweiler which has family housing and adjoins a small village, the installations should not be considered for district heating.

The warehouse at Hoehmuehlbach has only one hot water heating boiler and thus can be no further centralized.

The caves at Messweiler have three boiler houses in relatively close proximity and are consequently a candidate for centralization. The optimum location should be the Bldg. 7287 boiler room and hot water the distributed fluid. Additional boilers and new chimney would be needed, with perhaps some boiler room expansion.

The depot at Fischbach has several small systems and could be centralized using Bldg. 7126 as the central facility.

Such centralized systems as mentioned above are often justified on such considerations as less operating labor, economics of size, etc., none of which apply to oil heating systems which operate well with little attention. In the case of coal fired systems centralization using larger boilers pays off well particularly when automatically fired.

Muenchweiler Hospital has a centralized coal fired boiler house distributing high pressure steam to thirty hot water converters in the various buildings. This system has no viable alternatives except centrally generated hot water. This option has been ruled out by WESTON in the ECM analysis of Hot Water vs. Steam in Volume IIIB.

SECTION 6

INCREMENT F - FACILITIES ENGINEER CONSERVATION MEASURES

6.1 INTRODUCTION

Increment F requires the A/E to identify projects involving the modifications and changes in systems operation which are within the Facilities Engineer funding authority and management control. Included are low cost O & M (Operations and Maintenance) type projects and projects selected from Increments A, B, and G to be financed from OMA funding. It should be noted that Increment F was not a part of the initial contract, but was later added. An additional site visit was conducted in summer 1982 to gather data for each Increment.

A separate report has been submitted to meet the requirements for the Increment F Interim Submittal. Refer to that report for a complete discussion and calculations for the 21 projects developed for Increment F, and for a summary of projects from Increments A, B, and G.

6.2 SUMMARY OF INCREMENT F PROJECTS

Table 6.1 presents a summary of the 21 projects analyzed under Increment F. Refer to the Increment F report for a complete discussion and calculations of each project.

Several of the Increment F projects are analyzed on a "unit basis," i.e., per 100 ft^2 of ceiling area, per personnel door, per broken or missing window. This will enable Facilities Engineer personnel to develop appropriate projects on an ongoing basis using the methodology and data supplied with each project analyzed. Some projects are alternatives to others, and others are calculated only for a particular type of building use, and particular installation, but may be expanded to include other situations.

Table 6-1, refers to these unit values, and, therefore, installation and Community-wide totals are not appropriate.

TABLE 6.1

INCREMENT F PROJECTS SAVINGS, COSTS AND ECONOMICS SUMMARY

PIRMASENS MILITARY COMMUNITY

NOTE. All projects analyzed on a unit basis

Project No.	Project Name	Unit	Materials Cost ($)	Labor Time (hr)	Labor Cost ($)	Contracted Cost ($)	Annual Energy Savings (MBtu/yr)	Annual Energy Cost Savings ($/yr)	SIR
F-1	Repair holes in roof	Per opening	27.30	1.0	17.00	53.30	10.6	76	15.0
F-2	Cover unused flue opening	Per flue	6.30	1.5	17.60	28.70	6.3	46	10.2
F-3	Install double glazing to skylights	Per 100 ft.² skylights	306	8.0	136	532	6.5	66	0.66
F-4	Install insulated panel beneath skylights	Per 100 ft.² skylights	253	20	340	712	15.6	116	1.76
F-5	Install dropped ceiling	Per 1000 ft.² floor (ceiling) area	1,700	34	570	2,700	54.0	373	1.57
F-6	Install ceiling insulation	Per 100 ft.² floor (ceiling) area	360	20	300	900	30.9	210	2.15
F-7	Repair gaps at wall panel joints	Per repair	37	3.0	51	96	30.7	207	26.2
F-8	Replace glazing with insulated panel	Per 100 ft.² area	431	16	261	666	21.6	151	2.19
F-9	Replace glazing with glass block	Per 100 ft.² area	830	27.9	460	1,526	17.0	120	0.96
F-10	Repair broken and missing glazing	Ave repair	9.40	0.75	12.70	26.50	12.9	91	39.0
F-11	Seal and insulate unused vehic. doors	Per double doors	127	6.6	112	207	12.7	89.00	3.57
F-12	Repair openings in vehicular doors	Per repair	35	1.0	17.00	62	16.3	115	24.1
F-13	Install storm doors	Per door	80	1.8	17.60	126	2.23	15.80	1.46
F-14	Reduce domestic hot water temperature	Per heater	0	0.75	11.00	17.30	3.10	21.90	11.66
F-15	Regular cleaning of fluor. tubes and fixtures	Per 1000 ft.² office (increased fixtures)	0	3.9	23.00 per cleaning	21.40	1.46	6.06	9.90
F-16	Caulking	Per 100 ft. window	7.00	0.6	8.10	10.10	4.14	36.91	14.4
F-17	Disconnect unused ball.	Per 10 ballasts	0	3	50.20	69.00	1.90	0.01	1.27
F-18	Repair openings in walls	Per 1 ft.² opening	3.56	2	31.50	42.07	10.3	70.04	27.4
F-19	Air curtains	Per air curtain	5,300	9	169	6,350	159	611	1.45
F-20	Loading dock seals	Per dock seal	600	14	200	1,060	133.2	500	3.32
F-21	Loading dock shelters	Per dock shelters	1,110	15	250	1,610	63.2	177	1.67

SECTION 7

ENERGY PLAN

7.0 MATRIX OF ENERGY SAVINGS

The ECM's investigated were combined to produce five ECIP Projects. These projects are prioritized in Table 7-1 according to decreasing SIR. Their percent energy consumption reduction is also calculated and shown in the last column. Totals for all 5 ECIP Projects are included.

7.1 PREDICTED ENERGY SAVINGS

Figures 7.1, 7.2, and 7.3 graphically represent the energy savings to be realized by the implementation of ECIP projects. Figure 7.1 is a Pie Graph which illustrates the total Community Energy Consumption by fuel type before and after the implementation of the ECIP projects. Figure 7.2 shows the same data as Figure 7.1 in a bar chart format. Figure 7.3 is a Pie Graph that illustrates the total Community Energy Cost, before and after the ECIP projects.

TABLE 7-1

PRIORITIZATION OF ECIP PROJECTS

Priority	ECIP Proj. No.	ECIP Project Name	SIR	Project Cost ($)	Annual Energy Savings (MBtu/yr)	Annual Energy Cost Savings ($/yr)	Percent Energy Reduction of FY81 Use = 249,530 MBtu/yr
1	#4	Misc. Projects II	5.6	347,560	26,710.0	151,570	10.7
2	#2	Misc. Projects I	4.4	213,860	14,831.9	74,720	5.9
3	#3	Storm Windows	2.5	323,740	12,717.6	56,230	5.1
4	#1	Roof Insulation	1.9	651,270	17,410.4	96,000	7.0
5	#5	Pipe Insulation	1.1	286,100	4,920.0	20,100	2.0
Totals for All ECIP Projects				1,822,470	76,590.0	398,610	30.7

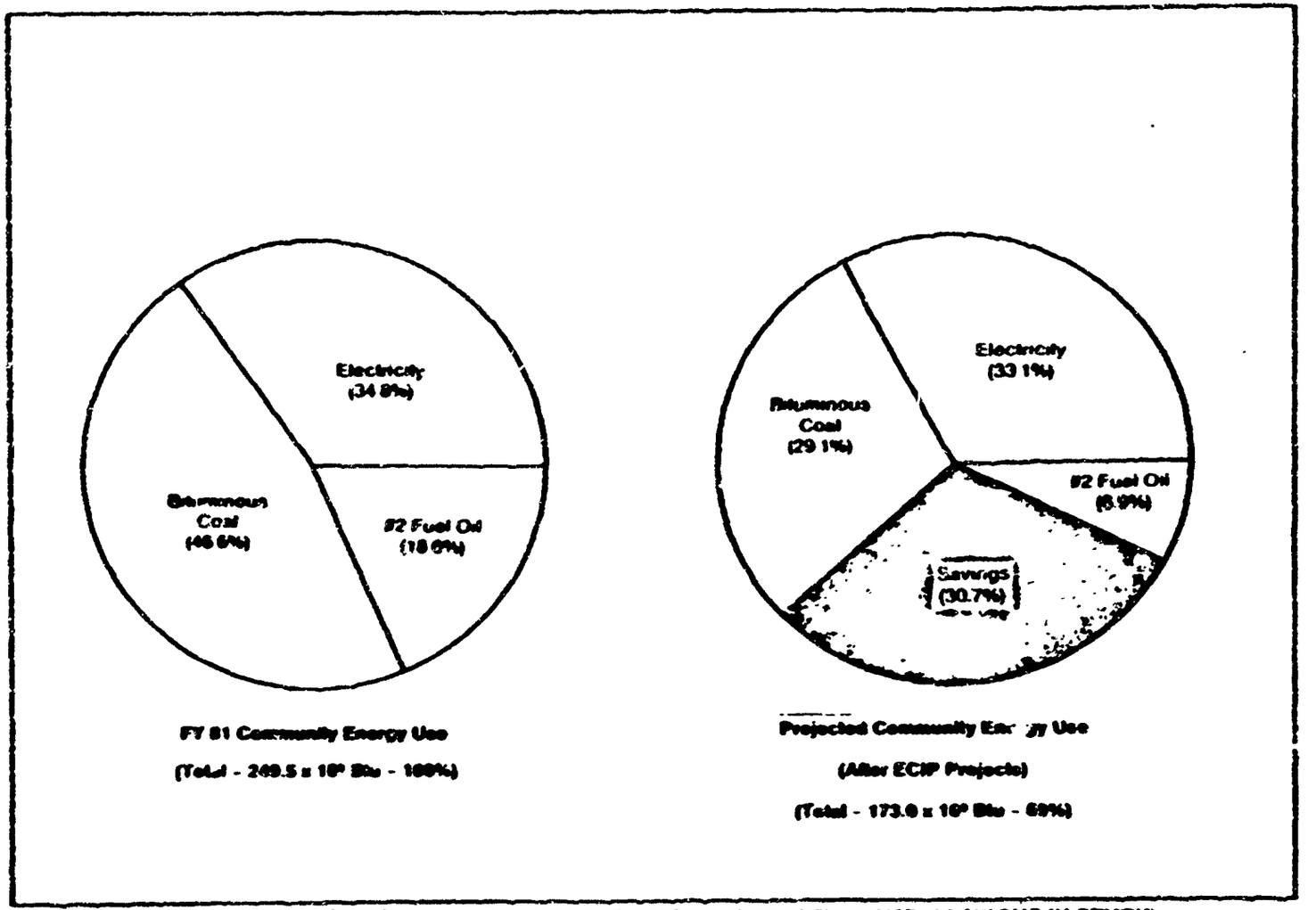


**FIGURE 7.1 PIRMASENS MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY)
PRESENT & PROJECTED COMMUNITY ENERGY USE BY FUEL TYPE
PIE CHART**

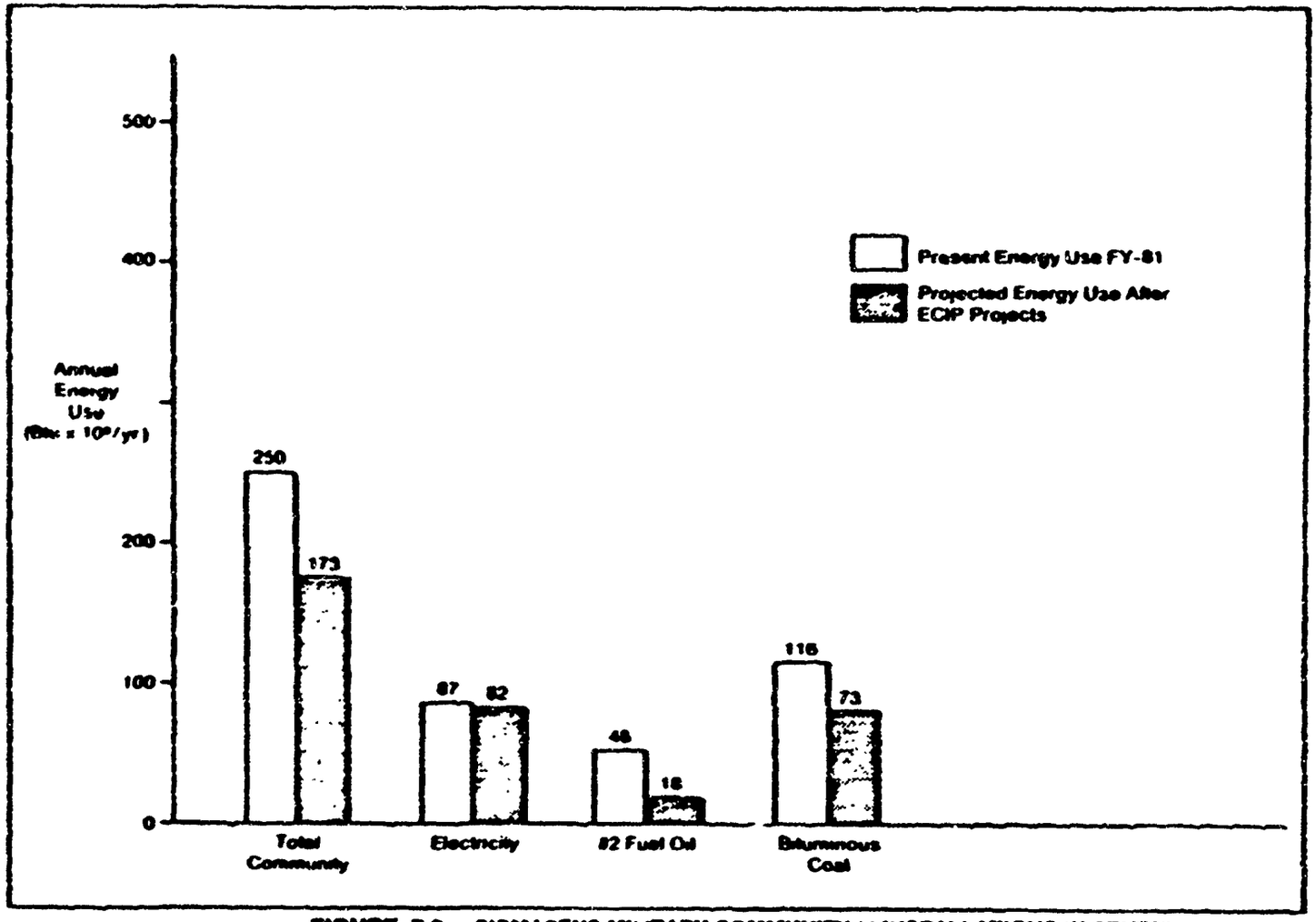


FIGURE 7.2 PIRMASENS MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY) PRESENT FY81 & PROJECTED ENERGY USE BY FUEL TYPE BAR CHART

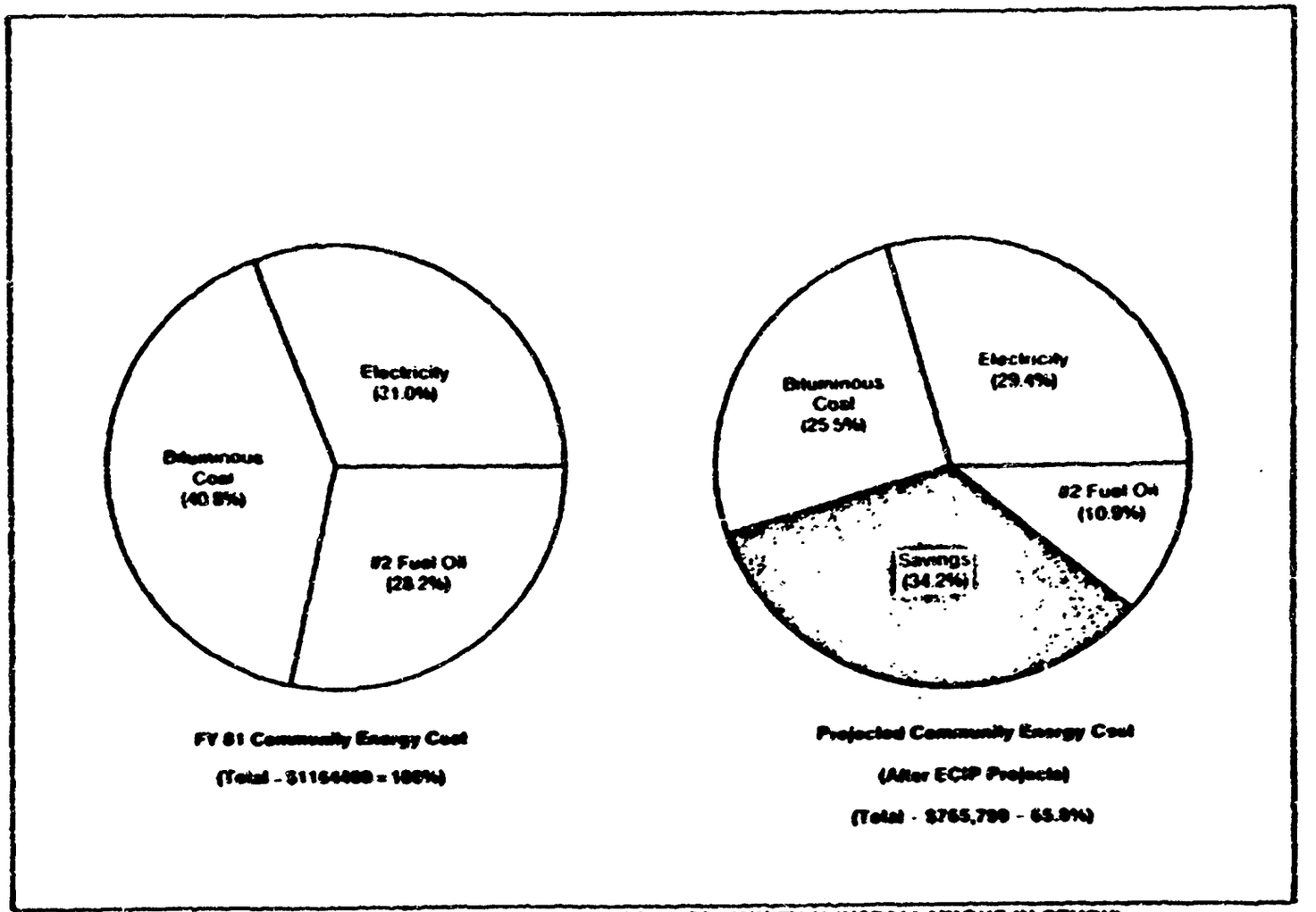


FIGURE 7.3 PINMASENS MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY)
PRESENT & PROJECTED COMMUNITY ENERGY USE BY FUEL TYPE
PIE CHART

SECTION 8

ORGANIZATION OF REPORT

This section has been prepared to provide a comprehensive summary of the organization of this report. It includes a listing of all valid volumes of the report as well as copies of their Tables of Contents. A complete current copy of WESTON's EEAP Package #5 for the Pirmasens Military Community is comprised of the following volumes:

Title	Submittal Date
Preliminary Submittal Volumes I-X	15 February 1982
Volume I - Executive Summary	May 1984
Volume II - Main Report	November 1983
Volume III - Appendix	November 1982
Volume IIIB - Appendix	November 1983
Volume IV - Bundles/1391's	May 1984
Volume V (A-E) ECIP Support Data	November 1982
Increment F	November 1983
Documentation of Computer Analysis	October 1983
Addendum	May 1984

PRELIMINARY SUBMITTAL VOLUMES I - X

The Preliminary Submittal of this report was made in February of 1982 and consisted of 2 volumes. The purpose of this submittal was to present all data gathered during Phase I. Both physical data and operational data on each surveyed building is presented. The organization of the Preliminary Submittal is as follows:

Volume	Installations
Volume I	Nunnchweiler Hospital
Volume II	Fischbach Ord Depot
	Hauswailer U.S. Storage
	Nonnmuehlbach Railhead

VOLUME I - EXECUTIVE SUMMARY

The purpose of the Executive Summary is to provide management level information in a concise volume. The most current edition is May 1984. The Table of Contents for this volume can be found on Page i.

VOLUME II - MAIN REPORT

The Main Report (Narrative Report) contains the basis of analysis and the results of the study. It is a comprehensive volume and was last submitted in November of 1983. All modifications to the November 1983 edition can be found in the Addendum, submitted with the Prefinal Submittal. The following spells out the organization of the Main Report.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

VOLUME III - APPENDIX

Volume III - Appendix was submitted in November of 1982 and has never required updating. Its primary purpose is to provide support data and to that end it contains samples of the computer analysis, Table information used in the computer analysis and copies of the Scope of Work and Minutes of the Pre-negotiation Meeting. The Table of Contents for this volume is as follows:

VOLUME III

APPENDIX

TABLE OF CONTENTS

VOLUME IIIB - APPENDIX

Volume IIIB - Appendix, prepared in November of 1983, is a supplement to the original Appendix (11/82). It contains the complete analyses of all conservation opportunities that WESTON evaluated manually. These are primarily specialty opportunities that cannot easily be evaluated by computer. The organization of Volume IIIB is as follows:

VOLUME III B

APPENDIX

TABLE OF CONTENTS

VOLUME IV - BUNDLES/1391's

Volume IV - Bundles of this project has been prepared in May of 1984. It contains the complete 1391's for each of the five ECIP Projects prepared for Pirmasens. This Volume has been assembled in a three-ring binder for ease of modification. The organization of Volume IV is as follows:

VOLUME IV - BUNDLES

TABLE OF CONTENTS

TITLE OF SECTION

- Installation of Roof Insulation
- Storm Windows
- Miscellaneous Projects I
- Miscellaneous Projects II
- Pipe Insulation

VOLUME V (A) ECIP SUPPORT DATA

This volume was prepared and submitted in November 1982 and contains the results of each opportunity evaluated for each building. These printouts are contained in a black, three-ring binder and requires no updating. The following indicates the contents of the binder:

Volume	Contents
A	Wall Insulation
	Roof Insulation
	Storm Windows
	Energy Efficient Windows
	Weatherstrip Windows
	Weatherstrip Personnel Doors
	Replace Personnel Doors
	Weatherstrip Vehicular Doors
	Flow Restrictors
	Interior Lighting Conversion
	Exterior Lighting Conversion

INCREMENT F

The Increment F Submittal of this report was last made in November of 1983. This volume contains data for use by the Facilities Engineer in approaching day-to-day problems. The Table of Contents for Increment F is as follows:

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

DOCUMENTATION OF COMPUTER ANALYSIS

This document was prepared at the request of EUD and submitted on a one-time basis. No comments requiring resubmission have been made. The information contained in this volume is as follows:

TABLE OF CONTENTS

ADDENDUM

The Addendum volume has been submitted in May 1984 to update the appropriate pages in the Interim Submittal. It is a one-time submittal. The updated pages will be inserted in their proper locations for the Final Submittal. The Addendum contains inserts for Volume II - Main Report and Volume IIIB - Appendix.